

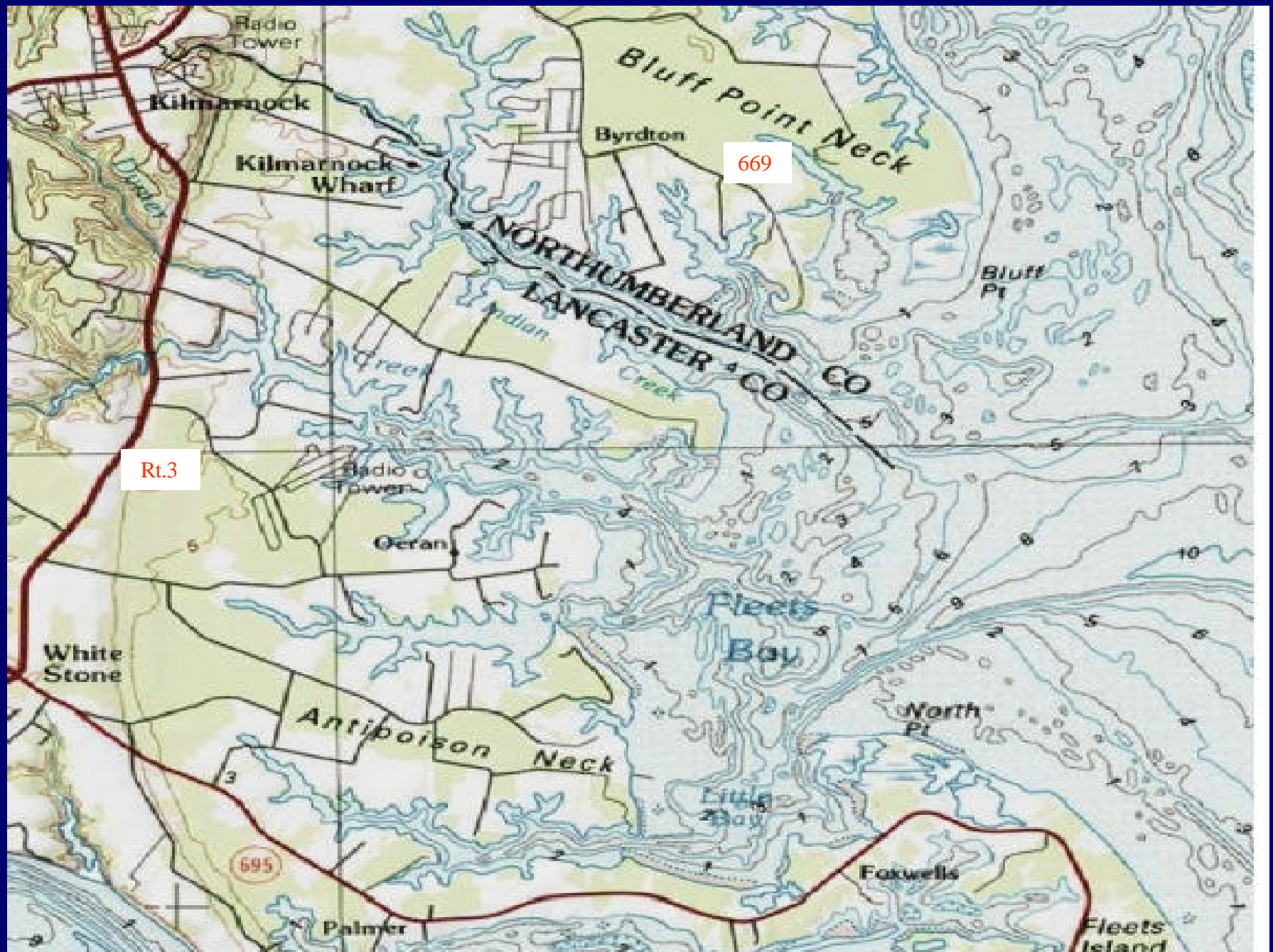
# Bacteria TMDL for Shellfish Waters in Indian, Dymmer, Tabbs, and Antipoison Creeks

Final Public Meetings



November 14, 2008  
Kilmarnock, VA







# *What is a TMDL?*

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TMDL = Total Maximum Daily Load =  
maximum amount of a pollutant that  
can enter a waterbody without violating  
water quality standards (WQS)



WQS = numeric or narrative limits on  
pollutants that ensure the protection of  
human health and of aquatic life

# *Why are TMDL studies necessary?*

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- ❑ TMDLs must be developed for water bodies that do not meet water quality standards (impaired waters).
- ❑ Impaired waters occur throughout Virginia in lakes, streams, and tidal waters.
- ❑ In Virginia, TMDLs for 210± impaired waters must be developed by 2010.
  - Of these, 25± are shellfish TMDLs under a consent order.



# *People involved in the Process:*

- ❑ Virginia Department of Health - Division of Shellfish Sanitation
- ❑ Virginia Department of Conservation and Recreation
- ❑ Virginia Department of Environmental Quality
- ❑ Other State Agencies, Local Governments and Planning Districts
- ❑ U.S. Environmental Protection Agency and other appropriate federal agencies
- ❑ Citizens groups, educational institutions environmental groups, & local business
- ❑ **YOU!**



# *What information is used to develop a TMDL?*

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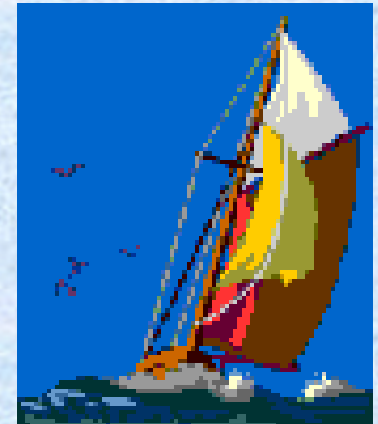
- ❑ VDH Sanitary Shoreline Survey
- ❑ VDH Bacteria monitoring data
- ❑ Population estimates for humans, pets, wildlife, livestock (Census, VIMS, DCR, DGIF, & the public)
- ❑ Affected waters volume
- ❑ Bacterial Source Tracking Data (BST)
- ❑ Land Use, Climate, Tide, etc.
- ❑ DEQ permit data
- ❑ DEQ spill response and remediation data



# Virginia's TMDL Development Process

- ❑ Public notice for TMDL development
- ❑ TMDL study
- ❑ Public notice for Draft TMDL
- ❑ Final TMDL report
- ❑ EPA approval
- ❑ Implementation process

= = > \* \* Many opportunities for public  
input and participation! \* \*

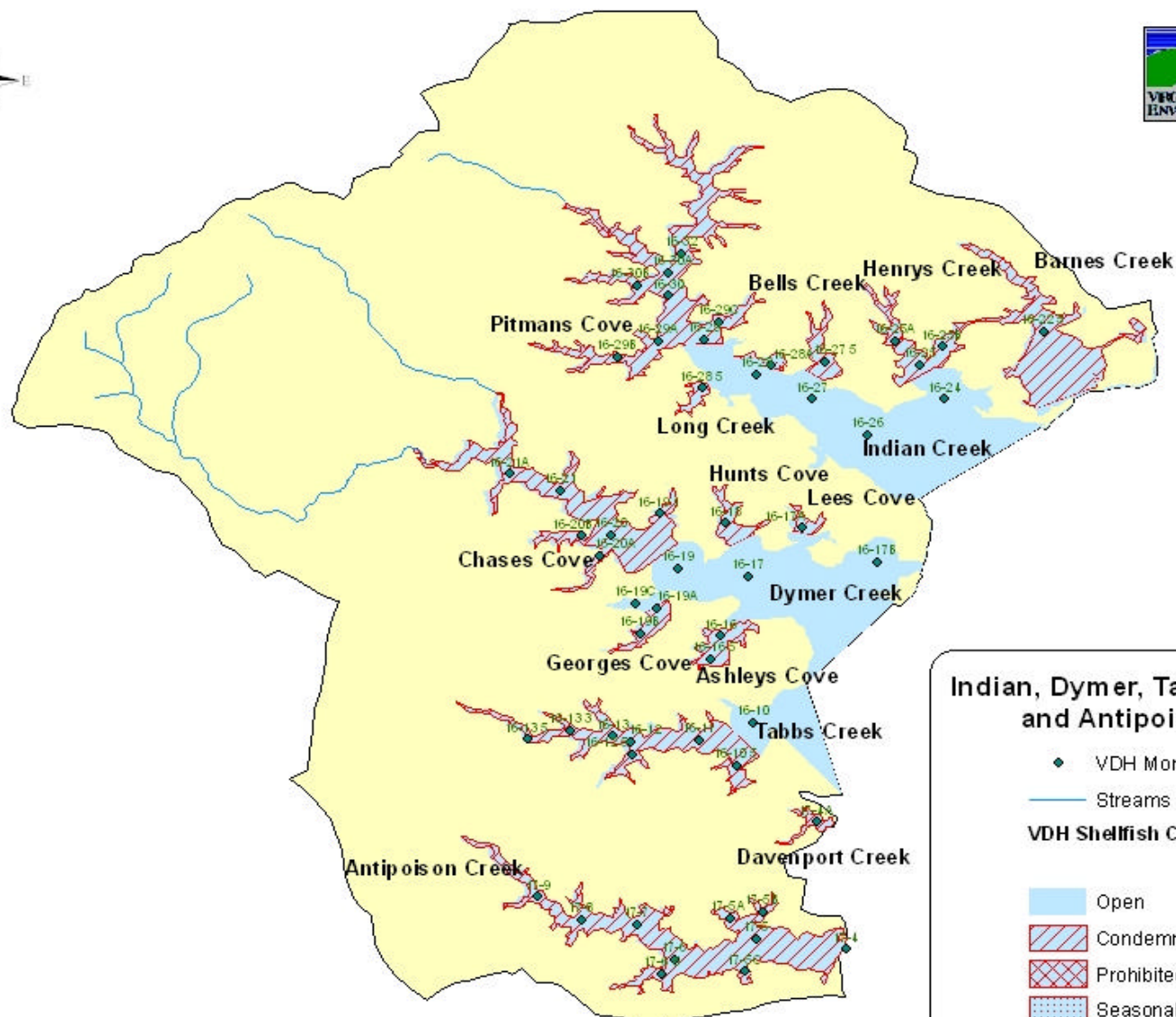


# *Why is a TMDL needed for the Indian, Dymer, Tabbs & Antipoison Creeks Watersheds?*

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- ❑ VDH Division of Shellfish Sanitation (DSS) monitors fecal coliform levels in shellfish waters
- ❑ Applicable water quality standards
  - ❑ 30-month geometric mean not exceeding 14 MPN/100 mL
  - ❑ and a 90th percentile not exceeding 49 MPN/100 mL
- ❑ The portions of Indian, Dymer, Tabbs, and Antipoison Creeks that currently fail these standards are:





### Indian, Dymer, Tabbs, Davenport, and Antipoison Creeks

◆ VDH Monitoring Stations

— Streams

#### VDH Shellfish Condemnations

Open

Condemned

Prohibited

Seasonally Condemned

Prohibited-Nonproductive

Estuarine Waters

Watershed

0 0.5 1 2 3 4 Miles

# Water Quality Data Summary for Indian Creek

\*90<sup>th</sup> Percentile represents the more stringent reduction\*

Creek Name	Station	Total Observations (1/mo)	Geometric Mean	Station Violates Geometric Standard: 14 MPN	90th Percentile	Station Violates 90th Percentile Standard: 49 MPN
Indian Creek Main Stem	16-26	262	5.3	No	28.78	No
	16-27	262	7.64	No	*52.36*	*Yes*
	16-28	263	8.03	No	43.45	No
	16-29	262	15.36	Yes	117	Yes
	16-30	264	28.21	Yes	453.09	Yes
	16-30A	264	39.73	Yes	484.86	Yes
	16-32	209	51.42	Yes	767.5	Yes
Barnes Creek	16-22_5	42	13.04	No	79.4	Yes
Henrys Creek	16-24	261	6.07	No	22.05	No
	16-25	259	11.2	No	71.78	Yes
	16-25A	44	13	No	69.03	Yes
	16-25B	44	8.87	No	62.37	Yes
Bells Creek	16-27_5	52	12.84	No	68.54	Yes
Long Creek	16-28_5	44	10.66	No	93.2	Yes
Un-named Cove	16-28A	26	**	**	**	**
Pitmans Cove	16-29A	261	31.09	Yes	365.02	Yes
	16-29B	259	66.46	Yes	680.92	Yes
Waverly Cove	16-30B	262	58.05	Yes	854.23	Yes
Arthur Cove	16-29C	44	9.38	No	54.63	Yes



# Water Quality Data Summary for Dymer Creek

\*90th Percentile represents the more stringent reduction\*

Creek Name	Station	Total Observations (1/mo)	Geometric Mean	Station Violates Geometric Standard: 14 MPN	90th Percentile	Station Violates 90th Percentile Standard: 49 MPN
Dymer Creek Main Stem	16-17	262	5.75	No	21.53	No
	16-19	207	8.30	No	46.06	No
	16-20	262	14.69	Yes	97.74	Yes
	16-21	262	32.03	Yes	280.51	Yes
	16-21A	254	66.26	Yes	606.66	Yes
Ashley Cove	16-16	261	11.09	No	66.10	Yes
	16-16_5	44	6.26	No	40.69	No
Lees Cove	16-17A	110	16.81	Yes	103.87	Yes
Rones Bay	16-17B	44	4.08	No	11.43	No
Hunts Cove	16-18	262	13.60	No	81.47	Yes
Georges Cove	16-19A	259	11.32	No	127.55	Yes
	16-19B	251	13.87	No	103.17	Yes
Poplar Neck Creek	16-19C	256	8.92	No	46.93	No
Johnsons Cove	16-19_1	262	26.87	Yes	341.73	Yes
Unnamed Cove	16-20A	45	23.82	Yes	236.48	Yes
Chases Cove	16-20B	42	19.09	Yes	173.64	Yes

# *Water Quality Data Summary for Tabbs Creek*

\*90<sup>th</sup> Percentile represents the more stringent reduction\*

Creek Name	Station	Total Observations (1/mo)	Geometric Mean	Station Violates Geometric Standard: 14 MPN	90th Percentile	Station Violates 90th Percentile Standard: 49 MPN
Tabbs Creek	16-10	262	8.06	No	46.82	No
	16-10_5	44	9.00	No	49.65	Yes
	16-11	262	13.28	No	87.00	Yes
	16-12	259	37.82	Yes	349.15	Yes
	16-12_5	43	18.85	Yes	170.17	Yes
	16-13	257	63.18	Yes	553.19	Yes
	16-13_5	254	133.66	Yes	1015.53	Yes



# Water Quality Data Summary for Antipoison Creek

\*90<sup>th</sup> Percentile represents the more stringent reduction\*

Creek Name	Station	Total Observations (1/mo)	Geometric Mean	Station Violates Geometric Standard: 14 MPN	90th Percentile	Station Violates 90th Percentile Standard: 49 MPN
Antipoison Creek Main Stem	17-3	118	3.92	No	9.03	No
	17-4	260	12.54	No	104.64	Yes
	17-5	260	8.66	No	45.67	No
	17-6	260	12.67	No	96.69	Yes
	17-7	260	14.91	Yes	86.70	Yes
	17-8	259	24.12	Yes	159.83	Yes
Unnamed Cove North	17-5A	43	10.95	No	63.57	Yes
	17-5B	44	17.64	Yes	112.09	Yes
Unnamed Cove South	17-5C	43	13.71	No	77.04	Yes
Davenport Creek	17-4A	79	27.25	Yes	283.89	Yes
Harpers Creek	17-6_5	44	10.94	No	85.20	Yes

# Land Use in the Cumulative Watershed

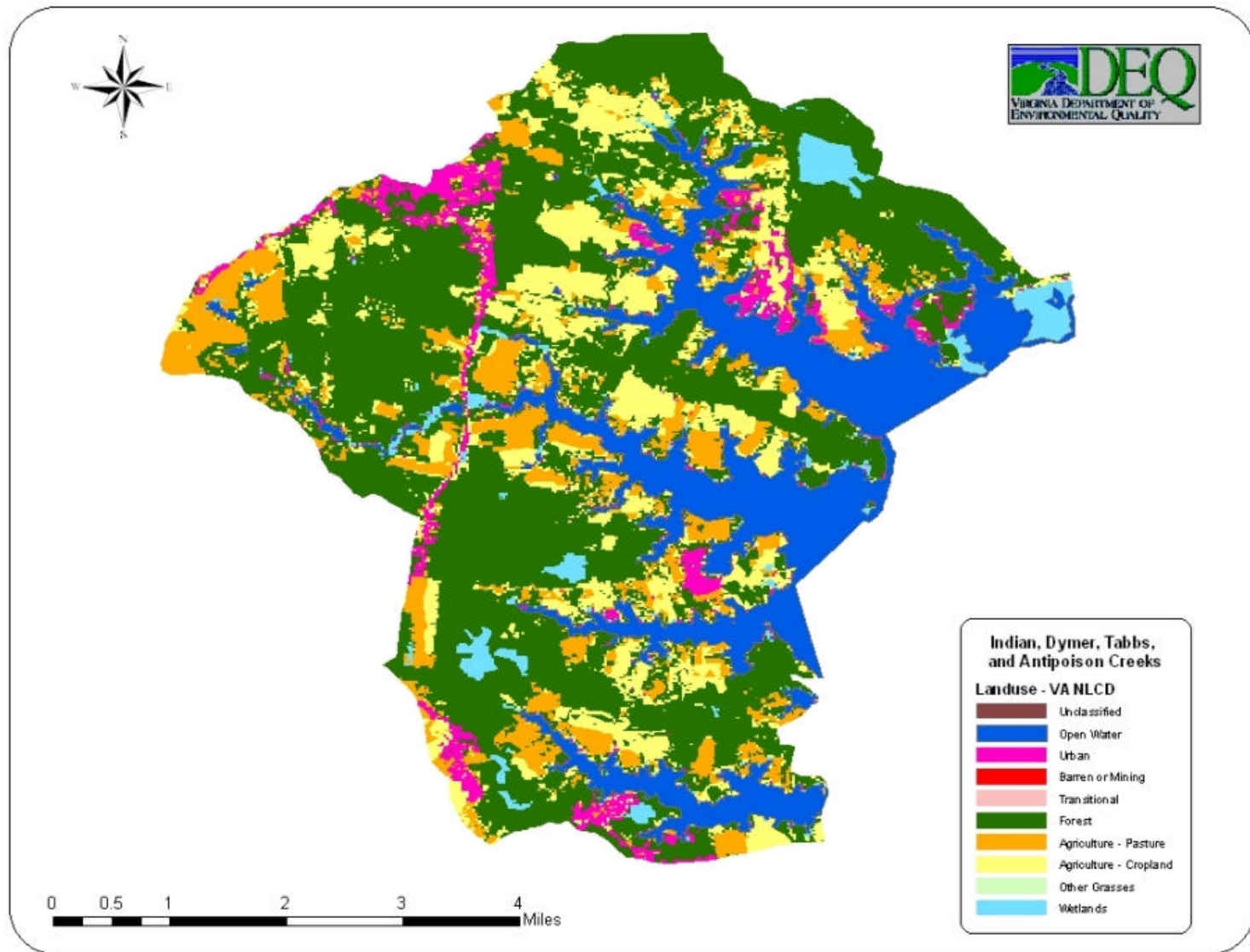




Figure 3.2 Indian Creek Land Use Percentages by Type

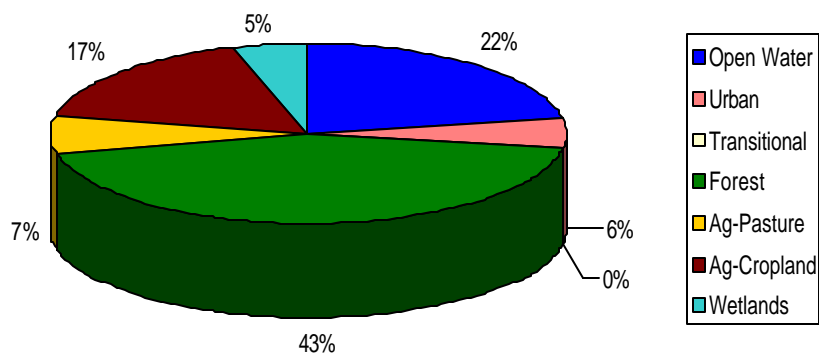


Figure 3.4 Tabbs Creek Land Use Percentages by Type

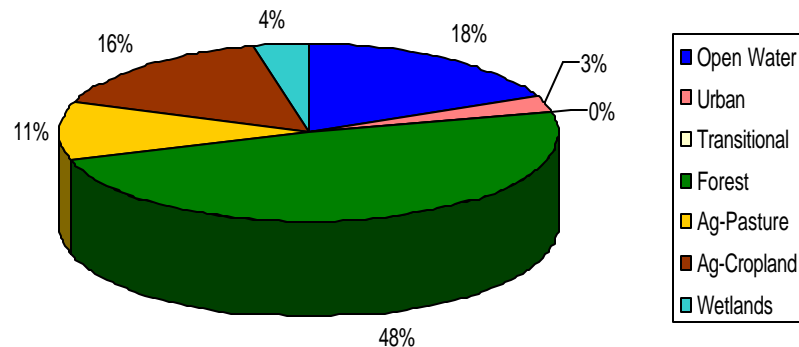


Figure 3.3 Dyrer Creek Land Use Percentages by Type

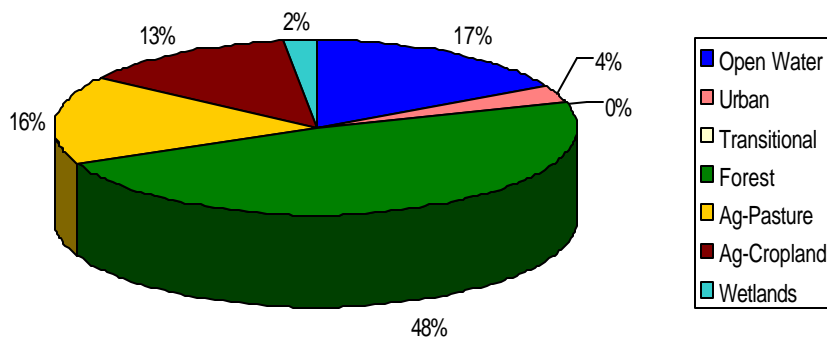
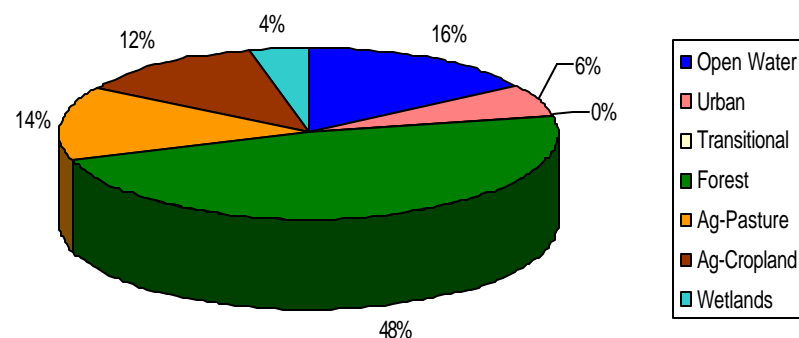


Figure 3.5 Antipoison Creek Land Use Percentages by Type



# *Tidal Volumetric Model + BST TMDL Approach*

- ❑ Calculate volume of impaired water
- ❑ Calculate the acceptable loading;

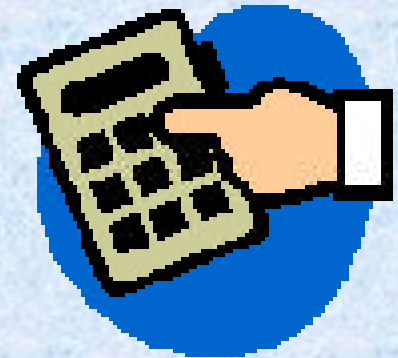
Water Quality Standard (WQS) x Volume

- ❑ Calculate actual loading;

Critical fecal count x Volume

- ❑ Source determination;

Fecal samples collected for BST are subjected to Antibiotic Resistance Analysis (ARA) and compared with known fecal samples



# *Use of Bacterial Source Tracking in TMDLs*

- ❑ VDH-DSS monitoring data is used to calculate critical fecal count
- ❑ Supplementary BST samples at selected stations are used to help identify bacteria sources
- ❑ Antibiotic Resistance Analysis - BST method for source load allocation into 4 categories:

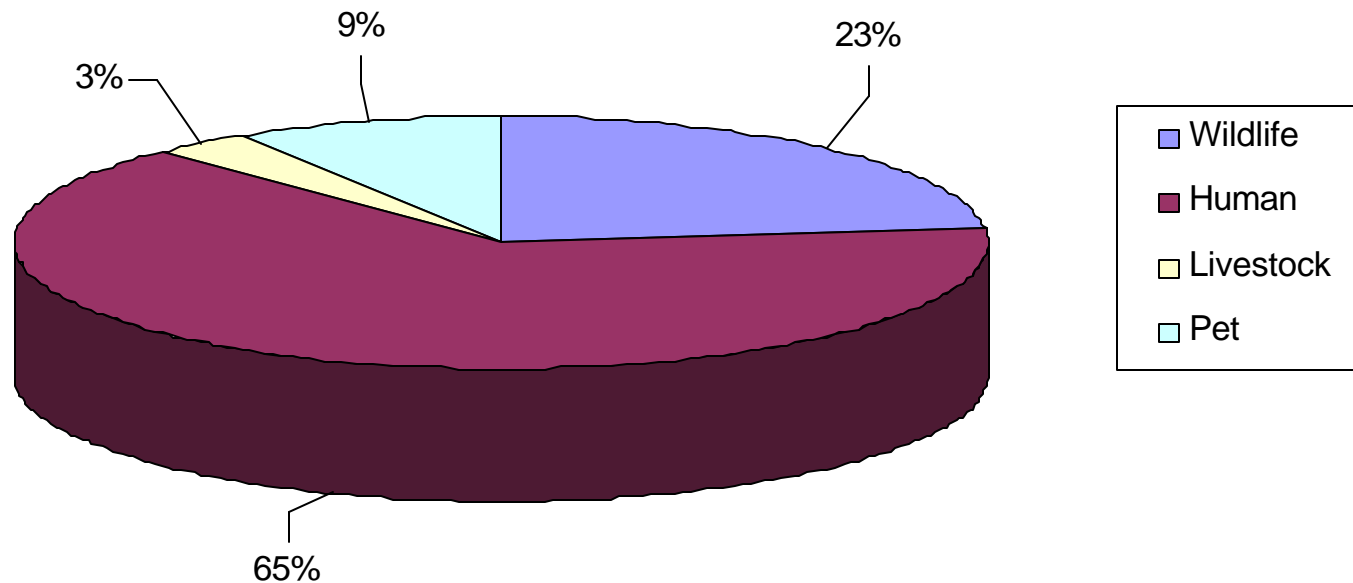


1. Human
2. Pets
3. Livestock
4. Wildlife



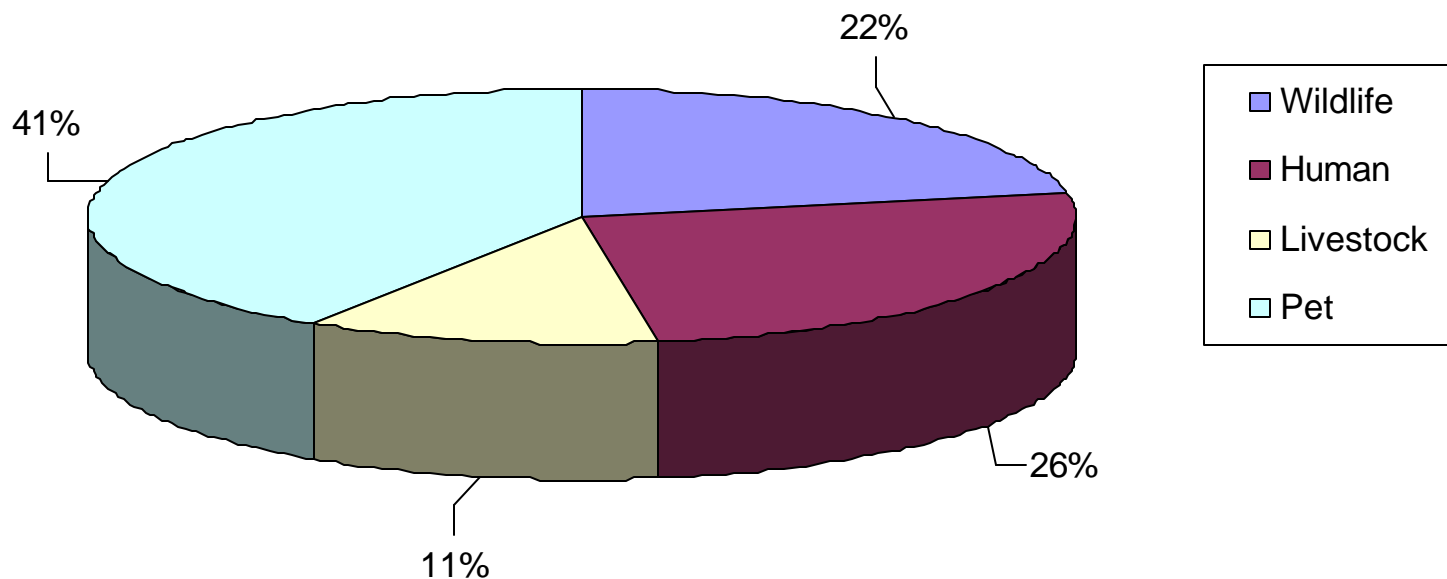
# *Weighted Indian Creek BST Results*

**Indian Creek and Tributaries Volume, Isolate, & Concentration Weighted BST by Source Type**



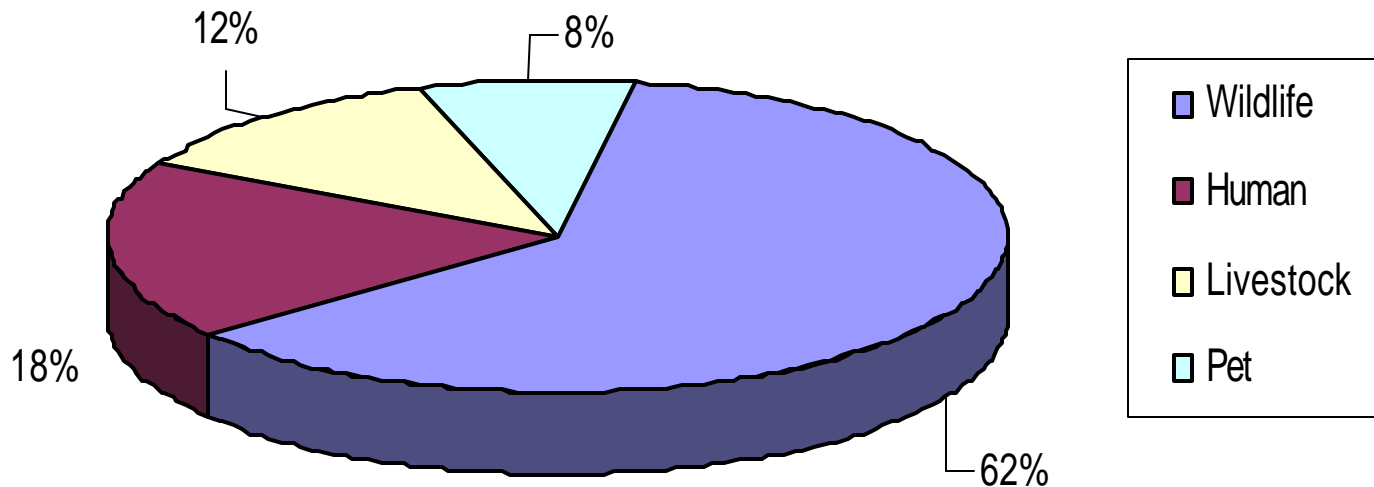
# *Weighted Dymer Creek BST Results*

**Dymer Creek and Tributaries Volume, Isolate, & Concentration Weighted BST by Source Type**



# *Weighted Tabbs Creek BST Results*

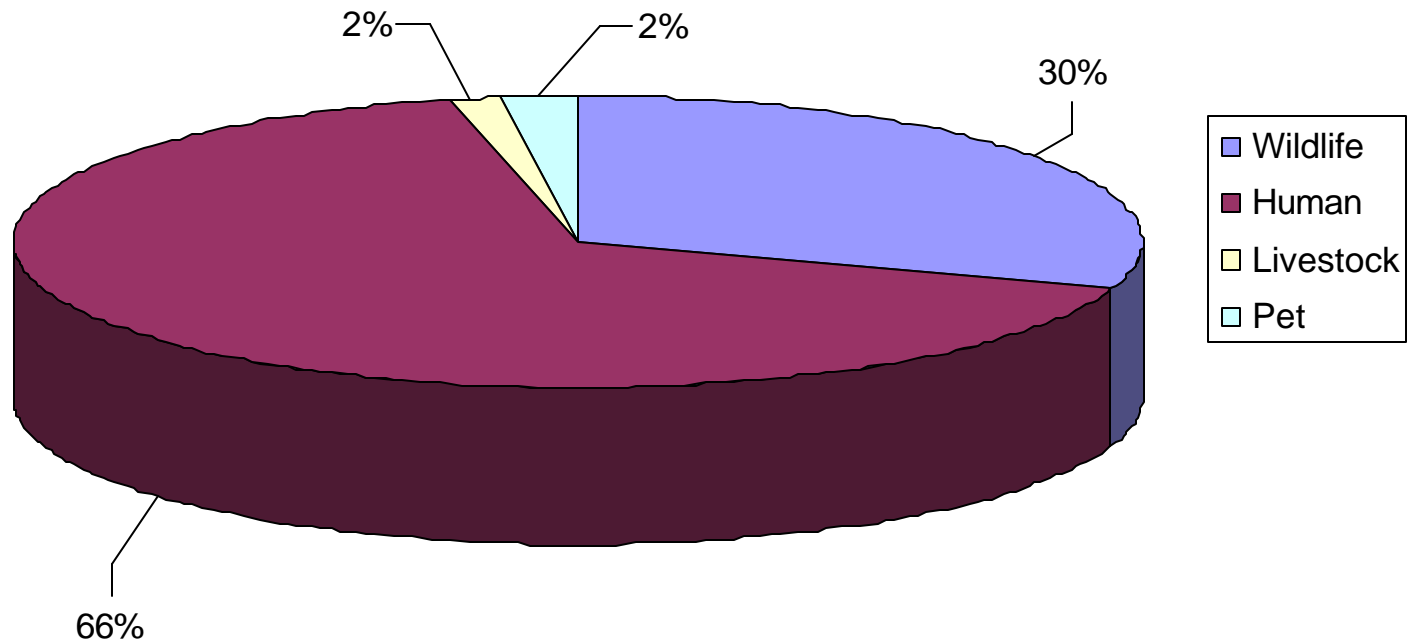
## Tabbs Creek Volume, Isolate, & Concentration Weighted BST Percentages by Source Type





# *Weighted Antipoison Creek BST Results*

**Antipoison Creek Volume, Isolate, & Concentration  
Weighted BST by Source Type**



# Observed Human and Livestock Non-point Sources



Fecal Coliform Sources	Indian Creek
Cattle	15
Chickens	5
Human	3
Fecal Coliform Sources	Dymer Creek
Horses	4
Human	3

Fecal Coliform Sources	Tabbs Creek
Cattle	16
Horses	35
Human	5
Fecal Coliform Sources	Antipoison & Davenport Creeks
Horses	15
Human	7

## Calculated Population Estimates for Wildlife and Dogs

Creek / County	Dogs	Deer	Raccoons	Ducks	Geese
Indian Creek	41	41	34	245	183
Lancaster					
Indian Creek Northumberland	87	76	136	601	447
Dymer Creek Lancaster	162	171	211	403	345
Tabbs Creek Lancaster	43	45	49	239	178
Antipoison Creek Lancaster	75	77	89	316	235
Total for Collective Watershed	408	410	520	1804	1388



# *Indian Creek Load Allocations & Future Growth based on 90<sup>th</sup> Percentile Standard*

***\*\*Un-named Cove values available 12/2008\*\****

Condemnation Area	Volume (m <sup>3</sup> )	90th Percentile Fecal Coliform (MPN/100ml)	90th Percentile W.Q. Standard Fecal Coliform (MPN/100ml)	MOS	Current Load (MPN/day)	TMDL Allowable Load (MPN/day)	Required Reduction
Indian Creek Main Stem	2113725	854.2	49	Implicit	1.81E+13	1.04E+12	94 %
Barnes Creek	745896	79.4	49		5.92E+11	3.65E+11	38 %
Henry's Creek	43478	71.8	49		3.12E+11	2.13E+11	32 %
Bells Creek	254665	68.5	49		1.75E+11	1.25E+11	28 %
Long Creek	64641	93.2	49		6.02E+10	3.17E+10	47 %
Un-named Cove	95634	***	49		***	***	***



# *Indian Creek Waste Load Allocations based on 90<sup>th</sup> Percentile Standard*

## *Kilmarnock WWTP*

Design Flow (MGD) Outfall 001 or 002	Design Flow (mL/D)	Fecal Coliform Limit (Geomean)	Total Daily Load Outfall 001 or 002	Future Growth Factor of 1%	Total <i>Annual</i> Load Outfall 001 or 002	Total <i>Daily</i> WLA for Kilmarnock WWTP
0.5	1.89E+09	14	2.65E+08	2.65E+06	9.78E+10	2.68E+08

# *Dymer Creek Allocations & Reductions based on 90<sup>th</sup> Percentile Standard*

Condemnation Area	Volume (m <sup>3</sup> )	90th Percentile Fecal Coliform (MPN/100ml)	90th Percentile W.Q. Standard Fecal Coliform (MPN/100ml)	MOS	Current Load (MPN/day)	TMDL Allowable Load (MPN/day)	Required Reduction
Dymer Creek Main Stem	1683593	606.7	49	Implicit	1.02E+13	8.25E+11	92%
Ashley Cove	239334	66.1	49		1.58E+11	1.17E+11	26%
Georges Cove	142993	127.6	49		1.82E+11	7.01E+10	62%
Hunts Cove	214452	81.5	49		1.75E+11	1.05E+11	40%
Lees Cove	51140	103.9	49		5.31E+10	2.51E+10	53%

# *Tabbs Creek Load Allocations & Reductions* *based on 90<sup>th</sup> Percentile Standard*

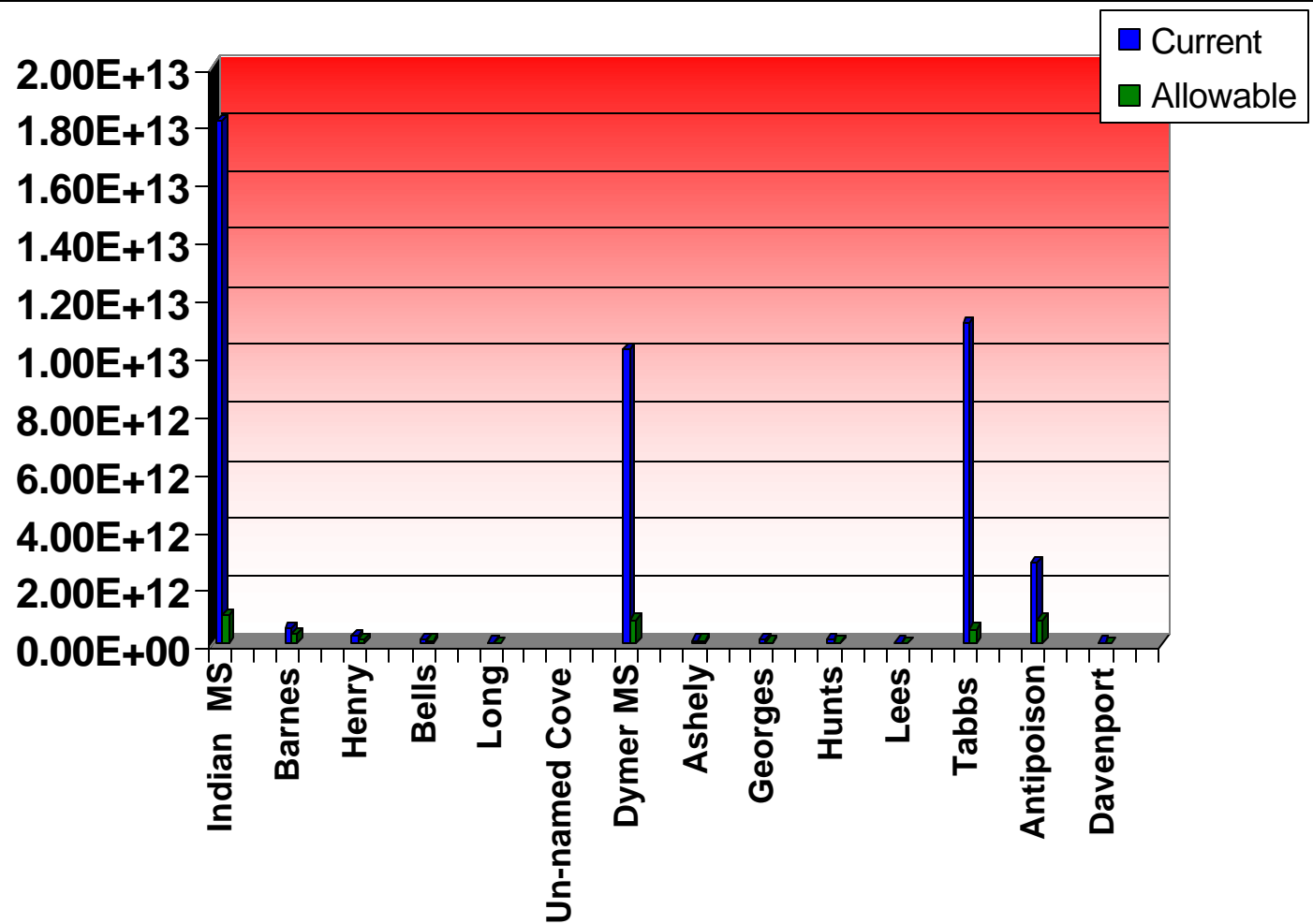
Condemnation Area	Volume (m <sup>3</sup> )	90th Percentile Fecal Coliform (MPN/100ml)	90th Percentile W.Q. Standard Fecal Coliform (MPN/100ml)	MOS	Current Load (MPN/day)	TMDL Allowable Load (MPN/day)	Required Reduction
Tabbs Creek	1094019	1015.5	49	Implicit	1.11E+13	5.36E+11	95%



# *Antipoison & Davenport Creeks Load Allocations & Reductions based on 90<sup>th</sup> Percentile Standard*

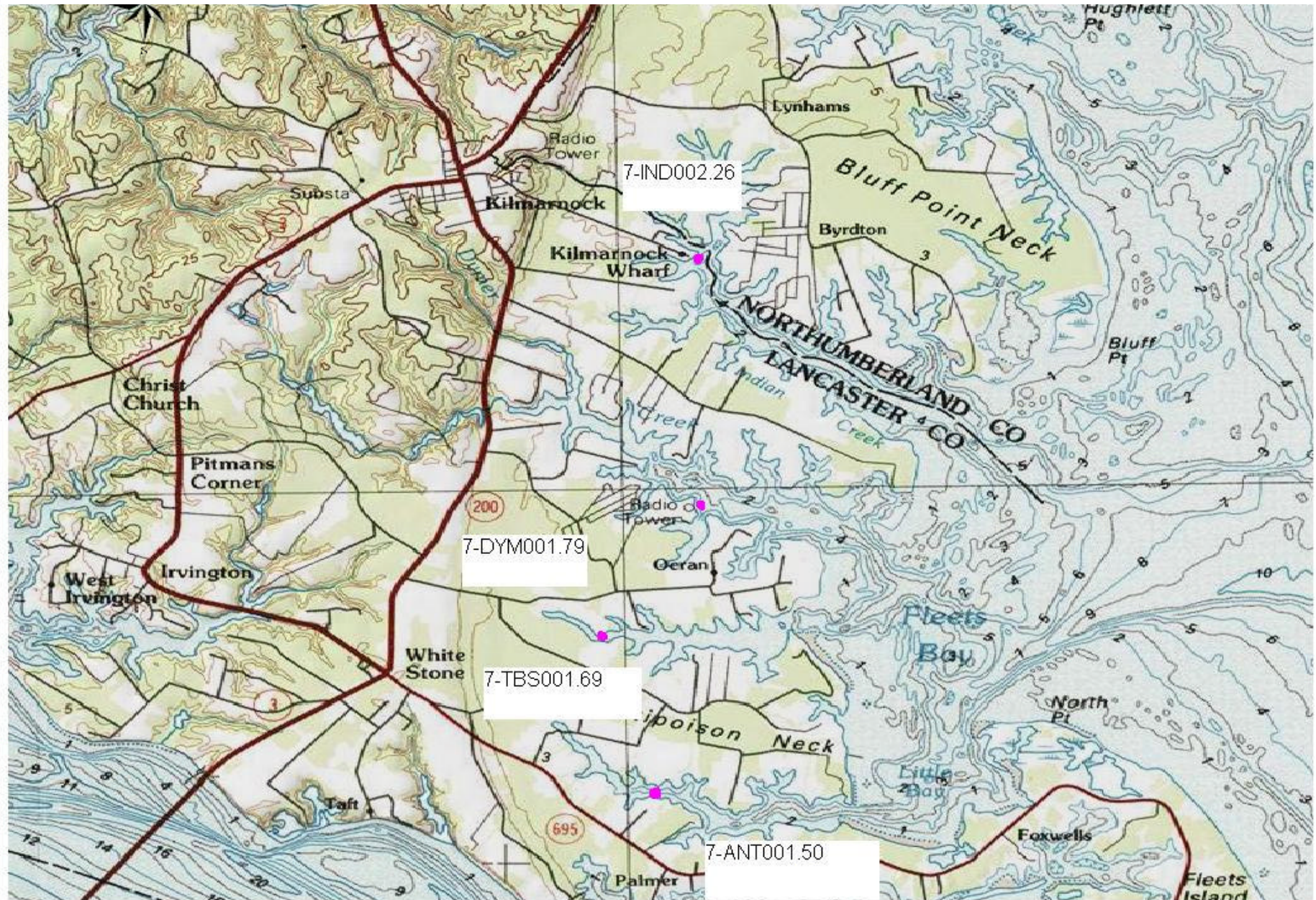
Condemnation Area	Volume (m <sup>3</sup> )	90th Percentile Fecal Coliform (MPN/100ml)	90th Percentile W.Q. Standard Fecal Coliform (MPN/100ml)	MOS	Current Load (MPN/day)	TMDL Allowable Load (MPN/day)	Required Reduction
Antipoison Creek	1755494	159.8	49	Implicit	2.81E+12	8.60E+11	69 %
Davenport Creek	28118	283.9	49		7.98E+10	1.38E+10	83 %

# Current Load vs. Allowable Loads: Indian, Dymer, Tabbs, and Anitpoison Creeks Watersheds





# Map of Recreation Use Monitoring Stations In the Indian, Dymer, Tabbs, & Antipoison Creeks





# *Indian Creek Recreation Impairment* *(C01E-29-BAC) Allocations and Reductions*

*(near Kilmarnock Wharf)*

Impaired Water body Segment	Volume (m <sup>3</sup> )	Bacteria Pollutant	Current Load	Load Allocation (cfu/day)	Wasteload Allocation (cfu/day)	TMDL	Required Reduction
Indian Creek (C01E-29-BAC) Northumberland County	2128348.6	<i>Enterococci</i>	1.70E+13	2.20E+12	6.56E+08	2.21E+12	87%

*Calculations based on Enterococci Instantaneous Standard of 104*

## *Indian Creek Recreation Standard Monitoring Summary*

Station ID	Period of Record	Bacteria Constituent	Total Observations	Minimum (cfu/100 mL)	Maximum (cfu/100 mL)	Primary Contact Violation Rate <sup>a</sup>
7-IND002.26	7/2003 to 10/2008	<i>Enterococci</i>	50	10	800	12%

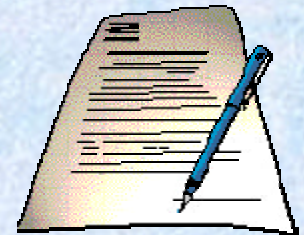
At least two exceedences and >10.5% of the total single samples taken during the assessment period must exceed the instantaneous maximum bacteria standard (of 104/100mL) for recreation use to be deemed impaired.



# *Next Steps...*

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- ❑ **30 Day Public Comment Period**
  - Ends December 15th, 2008
  - Comments must include the name, address, and telephone number of the commenter. All comments will receive a written response and will be incorporated into the final report that will be sent to EPA.
- ❑ **Report Submitted to EPA for approval**
- ❑ **Implementation Planning** (scheduling by DCR)



# Questions?? Comments??

**Draft Report Link:**

**<https://www.deq.virginia.gov/TMDLDataSearch/DraftReports.aspx>**

**Presentation available at:**

**<http://www.deq.virginia.gov/tmdl/mtgppt.html>**

**Please send written comments or questions to:**

**DEQ - Piedmont Regional Office**

**Attn: Margaret Smigo**

**4949-A Cox Road**

**Glen Allen, VA 23060**

**Email: [mjsmigo@deq.virginia.gov](mailto:mjsmigo@deq.virginia.gov)**



**TMDL Website: <http://www.deq.virginia.gov/tmdl>**



# Point Sources

Stream Name	Facility Name	VPDES Permit Number	Outfalls	Permit Type	Design Flow (MGD)
UT to Indian Creek	Kilmarnock Waste Water Treatment Plant	VA0020788	001, 002	Municipal Minor	0.5 MGD
Georges Cove (tributary to Dymer Creek)	Dymer Creek Seafood	VAG524024	001, 002	Seafood General	N/A
Georges Cove (tributary to Dymer Creek)	Ocran Boat Shop	VAR051153	001	Storm Water General	N/A
Antipoison Creek	Pride of Virginia Seafood & Bait Co.	VAG524039	001, 002, 003	General	N/A